IEEE 488

IEC 625

PM2811-PM2812-PM2813
PM2831-PM2832

PROGRAMMABLE POWER SUPPLIES

Programming Card

4822 872 80169 920305

KEY REFERENCES

◄ (backspace)
Erases the input of the previous keystroke. It also aborts the execution of the STEP function.

. (decimal point)
Enters a decimal point.

- I +
Adjusts the output current setting.

- V +
Adjusts the output voltage setting.

0, 1, 2, 3, 4, 5, 6, 7, 8, 9 (numeric keys)
Enters a decimal figure.

PHILIPS

PHILIPS

AUX

Executes auxiliary interface and control functions:

step	function	keys to be used
1	STEP MENU:	ENTER (►1a), AUX (►2)
a	• AUTO STEP	ON, OFF
b	• step TIME INTerval	0 ... 9, ENTER (0.1-60)
c	• CONTINUOUS step	ON, OFF
d	• sequence START AT	0 .. 9, ENTER (1-99)
e	• sequence STOP AT	0 .. 9, ENTER (1-99)
2	COUPLE PARAmeters	ON, OFF
3	COUPLE PROTection	ON, OFF
4	STandBY AT Power ON	ON, OFF
5	display CONTRAST	0 ... 9, ENTER (0-9)
6	KEYboard LOCK	ON, ENTER
7	GPIB interface ADDRESS	0 ... 9, ENTER (0-30)
8	device identification	SELECT (PM283x Sy.y N:zz)
9	CALibration access CODE	0 ... 9, ENTER (xxxx)

DELAY

Verifies or changes the reprogramming delay time in units of 0.001 seconds up to 60.00 seconds.

DISP

Displays and clears the fault register for the selected output channel. The decimal number is the sum of the 1-bit values:

bit:	*value:*	*meaning:*	
bit 0 = 1 adds	1	CV	Constant Voltage
bit 1 = 1 adds	2	CC	Constant Current
bit 2 = 1 adds	4	OV	Over Voltage
bit 3 = 1 adds	8	OC	Over Current
bit 4 = 1 adds	16	FL	Failure (overtemperature/sense break)
bit 5 = 1 adds	32	UNR	Unregulated output
bit 6 = 1 adds	64	CP	Coupled Parameters
bit 7 = 1 not used			
max. dec. nr.=	127		

ENABLE
DISABLE

(only applicable for multiple output units)

Enables or disables the selected output channel.

ENTER

Executes a command or a function.

I

Verifies or sets the current level of the selected output channel, rounded to the nearest multiple of the resolution.

LCL

Obtains local control over the power supply, if not in the 'local lockout' state.

OCP EN
OCP DIS

Enables or disables the overcurrent protection.

OFF, ON

Sets a predefined function or value ON(1 key) or OFF(0 key).

OPR
STBY

Sets all output channels of the power supply into the OPERATE mode or STANDBY mode.

OVP

Verifies or sets the overvoltage trip level of the selected output channel, rounded to the nearest multiple of the resolution.

RECALL

Recalls the stored voltage and current setting of all output channels from the recall memory address (1 .. 99).

RESET (key)

Resets the selected output channel. In the OPERATE mode the overvoltage, overcurrent, overtemperature and sense protection circuitry will be reset.

RESET (pencil-point operation button)

Resets the power supply without turning off the power, if activated with a pencil-point.

SELECT (only applicable for multiple output units)

Selects one of the output channels.

STEP

Steps from one recalled group of settings to the next one. The output value can be selected by pressing the V or the I key. The STEP function can be left by pressing the OPR/STBY or the ► (backspace) key.

STORE

Stores the actual voltage and current setting of all output channels into the recall memory address (1 .. 99).

UNMASK

Displays or sets the unmask setting of the selected output channel. The meaning of the unmask bits is as follows:

- bit 7 = DEN : Display ENabled of fault message of another output channel
- bit 6 = CP : Coupled Parameters will be adapted
- bit 5 = UNR : output is UNRegulated
- bit 4 = FL : output channel is in sense break (FaiL) or in overtemperature
- bit 3 = OC : output channel is in OverCurrent
- bit 2 = OV : output channel is in OverVoltage
- bit 1 = CC : output channel is in Constant Current mode
- bit 0 = CV : output channel is in Constant Voltage mode

V

Verifies or sets the voltage of the selected output channel, rounded to the nearest multiple of the resolution.

DISPLAY TEXT REFERENCES

ENABLED 1 2 3

Indicates which output channels have been enabled.

REM

Indicates that the power supply is in the remote mode of operation, i.e., programmed via the GPIB.

SRQ

Indicates that the power supply is requesting for service, i.e., has a message or data for the controller.

ANNUNCIATOR REFERENCES

STEP

Indicates that the step function is active.

FLT

Indicates that a bit is set in the fault register of the selected output channel.

CV

Indicates that the selected output channel is in the Constant Voltage mode of operation.

CC

Indicates that the selected output channel is in the Constant Current mode of operation.

OCP
EN

Indicates that the Over Current Protection for the selected output channel has been enabled.

COMMAND/QUERY REFERENCES

Syntax rules:

- Commands and corresponding queries have been combined.
- Common commands and queries begin with an asterix (*).
- Queries end with a question mark (?).
- Subsystem command/query parts start with a semicolon (:).
- The first semicolon (:) in a command may be left out.
- UPPER case letters in mnemonics are mandatory (short form). Lower case letters may be left out or must be specified completely (long form).
  Example: **:INSTrument** (long form) has the same effect as
  :INST (short form)
- Commands/queries may be given in uppercase or lowercase characters through one another (**SoUrCe** is allowed).
- Text between [and] is optional.
  Example: **:INST[:SEL]** has the same effect as **:INST**
- Text between { and } may be repeated.
  Example: **<id>{,<id>}** means e.g. <id>,<id>,<id>,<id>
- A choice is indicated by means of a | sign.
  Example: **0 | 1** means **0 or 1**

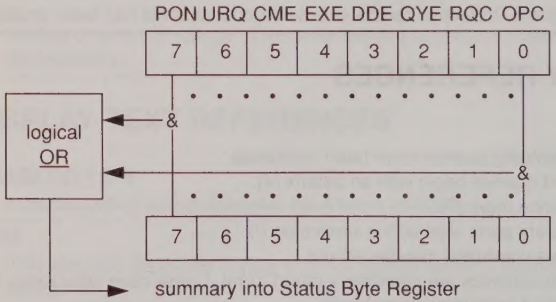
Command : *CLS

Clears the following status data structures:

1. Clears all Event Registers summarized in the Status Byte Register.
2. Empties all Queues, which are summarized in the Status Byte Register. The Output Queue, which is summarized in the MAV- bit, will only be cleared when the *CLS command is the only or the first command in a program message.

Command : *ESE <integer>
Query : *ESE?
Response : <integer>

<integer> is a whole positive number in the range 0 .. 255.
Sets or reports the standard Event Status Enable (ESE) register bits. This is to determine which bits in the standard Event Status Register (ESR) are enabled to be summarized in the Status Byte Register (STB).



Query : *ESR?
Response : <integer>

<integer> is a whole decimal number in the range 0 .. 255.
Reports the contents of the standard Event Status Register (ESR) and clears it.

PON	URQ	CME	EXE	DDE	QYE	RQC	OPC
7	6	5	4	3	2	1	0
0	0	0	1	1	1	0	0

(example = 28)

Query : *IDN?
Response : <identity string>

<identity string> = <Manufacturer>,<Model>,<Serial Number>, <Firmware Level>
Example = PHILIPS, PM2812/11,0,V1.0

Reports the identification of the instrument. The Serial Number and Firmware Level data are optional (0 returned).

Command : *OPC
Query : *OPC?
Response : 1

Causes the instrument to set or to report the OPeration Complete bit (OPC) in the standard Event Status Register (ESR) when all pending operations have been finished. When the *OPC command is sent, it will set the **OPC** bit (=bit 0) in the *ESR register when all pending operations have been completed. The response from the *OPC? query is always 1.

Command : *PSC <integer>
Query : *PSC?
Response : 0|1

<integer> is a whole decimal number from -32767 to 32767.
0 Power on Status Clearing disabled
1 Power on Status Clearing enabled (equals # 0)

Disables/enables or reports the clearing of the SRE (Service Request Enable register) and the ESE (standard Event Status Enable register) after power on.

Command : *RCL <location>

<location> is a whole decimal number in the range 0 .. 9.

Restores the programmable settings of the instrument from a specified location (rounded) in the local memory. Memory location 0 will select the power-on settings.

Command : *RST

Resets the instrument to the following settings:

:INSTrument:NSELect	1
:INSTrument:STATe	OFF (= STANDBY)
:OUTPut:STATe	OFF (= DISABLED)
:OUTPut:PROTection:COUPling:STATe	OFF
:SOURce:VOLTage:LEVel:IMMediate:AMPL	MIN *)
:SOURce:VOLTage:LEVel:IMM:AMPL:AUTO	OFF
:SOURce:VOLTage:PROTection:LEVel	MAX *)
:SOURce:CURRent:LEVel:IMMediate:AMPL	MIN
:SOURce:CURRent:LEVel:IMM:AMPL:AUTO	OFF
:SOURce:CURRent:PROTection:STATe	OFF
:SOURce:CURRent:PROTection:DELay	DEF *)
:SOURce:LIST:INDex:NSELect	MIN (=1)
:SOURce:LIST:SEQuence:STARt	MIN (=1)
:SOURce:LIST:SEQuence:STOP	MAX (=99)
:SOURce:LIST:SOURce	EXT(ernal)
:SOURce:LIST:TIMer	0.1 s
:INITiate:CONTinuous	ON
:DISPlay:ENABle	ON
:DISPlay:CONTrast	MAX (= 0.9)
:SYSTem:KLOCk	OFF
:SYSTem:POCLear	ON
:CALibration:STATe	ON

*) See the specifications in the Reference Manual, Appendix A.

Command : *SAV <location>

<location> is a whole decimal number in the range 0 .. 9.

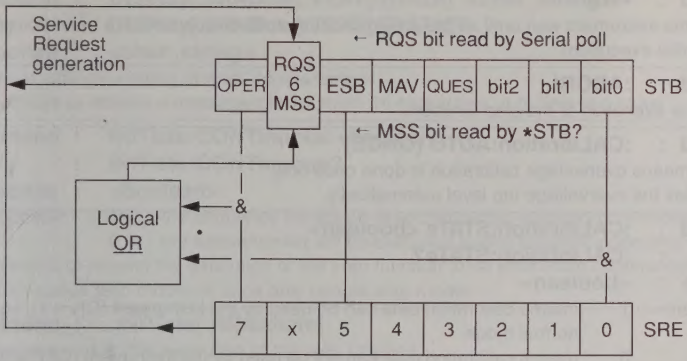
Stores the programmable settings of the instrument into a specified location (rounded) in the local memory. Memory location 0 has been reserved for the power-on settings.

Command : *SRE <integer>
Query : *SRE?
Response : <integer>

<integer> is a whole decimal number in the range 0 .. 63 or 128 .. 191 (bit 6 is 'don't care').

Sets or reports the bits in the Service Request Enable (SRE) register. They determine:

- which corresponding bits in the STatus Byte register (*STB) will cause a service request from the instrument.
- which corresponding bits in the Service Request Enable register (*SRE) will be summarized in the MSS-bit in the *STB register.

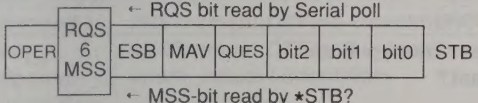


Query : *STB?

Response : <integer>

<integer> is a whole decimal number in the range 0 .. 255.

Reports the contents of the STatus Byte (STB) register, in which bit 6 reports the MSS (Master Summary Status).



Command : *TRG

Triggers the instrument, by means of the GPIB defined Group Execute Trigger (= GET) code. Used to execute the next step during execution of the step function.

Query : *TST?

Response : 0|1

0 is returned if the self-test is completed successfully

1 is returned if the self-test has failed

Returns the result of the following power-on self tests:

- ROM test
- RAM test
- GPIB controller test
- Microprocessor timer test
- Communication (D^2B) test
- Display controller test
- ADDA output channel(s) test

The self-test will not change internal instrument settings.

Command : *WAI

Makes the instrument wait until all the previous commands or queries have been completed (sequential execution).

Command : :ABORt

Stops the execution of the step function.

Command : :CALibration:AUTO [ONCE]

ONCE means overvoltage calibration is done once only.
Calibrates the overvoltage trip level automatically.

Command : :CALibration:STATe <boolean>
Query : :CALibration:STATe?
Response : <boolean>

<boolean> = 1 means calibration data can be used by the instrument (ON = 1), i.e. normal mode
0 means calibration data can not be used by the instrument (OFF = 0), i.e. calibration mode

The calibration data can be disabled (calibration mode) or enabled (normal mode) from being used.

Command : :CALibration:VALue <num_value>

<num_value> = numeric value representing the reference voltage or current for calibration.
Sends an externally measured voltage or current to the power supply to calibrate its voltage (VOLT mode) or current (CURR mode).

Command : :DISPlay:CONTrast <num_value>
Query : :DISPlay:CONTrast?
Response : <num_value>

<num_value> = number from 0.0 . . . 0.9.
Sets or returns the contrast of the display. 0.0 presents the lowest contrast and 0.9 presents the highest contrast.

Command : :DISPlay:ENABle <boolean>
Query : :DISPlay:ENABle?
Response : <boolean>

<boolean> = 1 means display turned on (ON = 1)
0 means display turned off (OFF = 0)

The display of the power supply can be turned on or off.

Command : DISPlay[:WINDow]:TEXT[:[DATA] <char_string>
Query : DISPlay[:WINDow]:TEXT[:[DATA]?
Response : <char_string>

<char_string> = string of max. 16 characters.

Displays or returns a message of maximum 16 characters, e.g. "this is a string".

Command : INITiate:CONTinuous <boolean>
Query : INITiate:CONTinuous?
Response : <boolean>

<boolean> = 1 the sequence list will be executed during stepping continuously (ON = 1)
0 the sequence list will be executed during stepping once only (OFF = 0)

Controls or reports the execution of the step function to be performed continuously (continuous step mode) or once only (single step mode).

Command : :INITiate[:IMMediate]

Starts (initiates) the execution of the step function.

Query : :INSTrument:CATalog?
Response : <identifier>,{<identifier>}

<identifier> logical name, e.g. outchan.

Reports the actual predefined <identifier> for every output channel available, e.g. chan1,chan2 for a dual output model. An empty string is returned, if no logical name has been defined, e.g. out1,,out3 (for a triple output model).

Command : :INSTrument:DEFine <identifier>,<num_value>
Query : :INSTrument:DEFine? <identifier>|<num_value>
Response : <num_value>|<identifier>

<identifier> = logical name
<num_value> = 1 (for single output models)
1 or 2 (for dual output models)
1, 2 or 3 (for triple output models)

Every output channel has been assigned to a fixed number. With the command an output channel number can be assigned to a logical name, e.g. out1,1. With the query the latest logical name belonging to an output channel will be reported (specify <num_value>) or the output channel belonging to a logical name (specify <indentifier>).

Command : :INSTrument:DELete:ALL
Command : :INSTrument:DELete[:NAME] <identifier>

ALL = deletes all defined names for all output channels
[:NAME] <identifier> = deletes the name <identifier>

Deletes one or all defined logical names for the output channel(s) concerned.

Command : :INSTrument:NSELect <num_value>
Query : :INSTrument:NSELect?
Response : <num_value>

<num_value> A numeric value specifying which output channel is selected.

Selects or returns the output channel number to be addressed during remote operation.

Command : :INSTrument[:SELect] <identifier>
Query : :INSTrument[:SELect]?
Response : <identifier>

<identifier> A logical name specifying which logical output channel is selected.

Selects or returns the logical name of an output channel to be addressed during remote operation.

Command : :INSTrument:STATe <boolean>
Query : :INSTrument:STATe?
Response : <boolean>

<boolean> = 0 means STANDBY mode (OFF = 0)
1 means OPERATE mode (ON = 1)

Places or reports the instrument in the OPERATE or in the STANDBY mode (factory set).

Query : :MEASure[:SCALar]:CURRent[:DC]? [<exp_value>[,<resol>]]
Query : :MEASure[:SCALar]:VOLTage[:DC]? [<exp_value>[,<resol>]]
Response : <meas_value>

<exp_value> = an estimation of the expected value
<resol> = the resolution of the expected value
<meas_value> = the measured current or voltage, e.g. 1.34

Returns the read back current or voltage of the selected output channel (<exp_value> and <resol> have no meaning).

Command : :OUTPut:PROTection:CLEar

Resets the protection circuitry of the selected output channel, i.e. the overvoltage, overcurrent, overtemperature or open sense protection circuits.

Command : :OUTPut:PROTection:COUPling[:INSTrument]
<id>{,<id>} | <num>{,<num>} | ALL | NONE
Query : :OUTPut:PROTection:COUPling[:INSTrument]?
Response : <num>{,<num>}

<id> = logical name for an output channel, e.g. out1
<num> = numeric value for an output channel (1, 2 or 3)
ALL = all channels coupled
NONE = no channels coupled, i.e. all previously defined couplings deleted

Defines or reports the coupling of the protection mechanisms of the selected output channel with one or more other output channels within the same power supply.

Example: <response> = 1,2, means that the output channels 1 and 2 have been coupled (and not channel 3).

Command : :OUTPut:PROTection:COUPling:STATe <boolean>
Query : :OUTPut:PROTection:COUPling:STATe?
Response : <boolean>

<boolean> = 0 means coupling mechanism disabled (OFF = 0)
1 means coupling mechanism enabled (ON = 1)

Enables(activates)/disables or reports the predefined coupling of the output channel protection mechanisms.

Query : :OUTPut:PROTection:TRIPped?
Response : 0|1

0 Protection circuit did not trip.
1 Protection circuit has tripped.

Reports the current state of the protection circuit of the selected output channel. The reason that a protection circuit trips can be overvoltage, overcurrent, open sense connection, overtemperature or coupled protection.

Command : :OUTPut[:STATe] <boolean>
Query : :OUTPut[:STATe]?
Response : <boolean>

<boolean> = 0 Output disabled (DISABLED state); OFF = 0
1 Output enabled (ENABLED state); ON = 1

Enables/disables the selected output channel or reports its state. The selected output channel becomes active, when it is enabled and when the power supply is in the OPERATE mode.

Command : [:SOURce]:CURRent[:LEVel][:IMMediate][:AMPLitude]
<current> | MIN | MAX | DEF

Query : [:SOURce]:CURRent[:LEVel][:IMMediate][:AMPLitude]?
MIN | MAX | DEF

Response : <current>

<current> A numeric value in the range 0 to the maximum output current of the output channel.

MIN Minimum level of the output current.

MAX Maximum level of the output current, depending upon the maximum power and the voltage setting.

DEF Actual value of the output current.

Sets or returns the output current for the selected output channel. The power supply will round the <current> parameter to the nearest multiple of the resolution.

Command : [:SOURce]:CURRent[:LEVEL][:IMMediate][:AMPLitude]:AUTO
<boolean>|ONCE

Query : [:SOURce]:CURRent[:LEVEL][:IMMediate][:AMPLitude]:AUTO?

Response : <boolean>

<boolean> = 0 means parameter coupling disabled (OFF = 0)
1 means parameter coupling enabled (ON = 1)

ONCE = coupled only for the next voltage and/or current setting command

Enables/disables or reports the coupling of the current and the voltage parameter of the selected output channel.

Query : [:SOURce]:CURRent:LIMit:HIGH?

Query : [:SOURce]:CURRent:LIMit:LOW?

Response : <current>

<current> = maximum (HIGH) or minimum (LOW) current setting.

Returns the maximum or the minimum current setting of the selected output channel.

Command : [:SOURce]:CURRent:PROTection:DELay <time>|MIN|MAX|DEF
Query : [:SOURce]:CURRent:PROTection:DELay? MIN|MAX|DEF
Response : <time>

<time> The reprogramming delay time in the range MIN to 60.0 seconds. The resolution is 1 millisecond.
MIN The minimum delay time (device dependent).
MAX The maximum delay time of 60 seconds.
DEF The default value.

Sets or returns the delay time for the selected output channel in the following cases:

- V_{set} (voltage setting) :SOURCE:VOLTAGE
- I_{set} (current setting) :SOURCE:CURRENT
- ENABLE output channel :OUTPUT:STATE ON
- reset over protection :OUTPUT:PROTECTION:CLEAR
- enter OPERATE mode :INSTRUMENT:STATE ON
- after a recall of voltage /current settings
- during stepping through voltage/current settings

Command : [:SOURce]:CURRent:PROTection:STATe 0 | 1
Query : [:SOURce]:CURRent:PROTection:STATe?
Response : 0 | 1

0 Overcurrent protection disabled (OFF = 0)
1 Overcurrent protection enabled (ON = 1)

Enables/disables the overcurrent protection (OCP) for the selected output channel or reports its state.

Query : [:SOURce]:CURRent:PROTection:TRIPped?
Response : 0 | 1

0 The overcurrent protection circuit did not trip.
1 The overcurrent protection circuit has tripped.

Reports whether the overcurrent protection circuit has been tripped or not. The overcurrent protection (OCP) circuit has been tripped, if the maximum current level has been exceeded and the overcurrent protection was enabled.

Query : [:SOURce]:FUNCtion:MODE?
Response : <char_string>

<char_string> The mode of an output channel can be:
- VOLT = constant voltage output (CV mode)
- CURR = constant current output (CC mode)

Reports the operating mode of the selected output channel.

Command : [:SOURce]:LIST:CURRent <num_val>{,<num_val>}

<num_val> Programmed current in the range from MIN to MAX.

Sets the current value at the selected memory address for the selected output channel. In one command as many currents can be specified as there are addresses to be filled. The filling of addresses is incremental, i.e. 1, 2, 3, etc.

Query : [:SOURce]:LIST:CURRent:POINts?
Response : <integer>

<integer> number of points in the current list from start unto and inclusive stop address.

Returns the number of current points (max. 99) in the predefined sequence list for the selected output channel.

Command : [:SOURce]:LIST:GENeration SEQuence
Query : [:SOURce]:LIST:GENeration?
Response : SEQuence

SEQuence the default sequence in the defined list.

Generates or reports the default sequence list (always SEQ).

Command : [:SOURce]:LIST:INDex[:NSELect] <integer>
Query : [:SOURce]:LIST:INDex[:NSELect]?
Response : <integer>

<integer> An address in the range of recall memory addresses. The range is from 1 to 99.

Selects or returns an address (index) in the recall memory. The index is applicable for all output channels.

Command : [:SOURce]:LIST:SEQuence:STARt <num_val>
Query : [:SOURce]:LIST:SEQuence:STARt?
Command : [:SOURce]:LIST:SEQuence:STOP <num_val>
Query : [:SOURce]:LIST:SEQuence:STOP?
Response : <num_value>

<num_val> The start or stop address in the range 1 to 99.

Sets or reports the start or stop address of the sequence list which will be executed in the step mode for all output channels. During stepping a sequential list of voltage and current settings will be executed. The sequence list begins at the start address and ends at the stop address.

Command : [:SOURce]:LIST:SOURce <char_string>
Query : [:SOURce]:LIST:SOURce?
Response : <char_string>

<char_string> = EXT EXTernal means that the STEP-trigger line or a GPIB trigger code becomes the source for the next step to be taken
= BUS BUS is identical to EXT
= TIM TIMer means that the interval timer determines the next step to be taken.

Sets or reports the trigger source for the step function in one of the following ways:
Automatically: In this case the next step is performed when the step interval time has expired.
Externally: In this case the next step is performed when a trigger pulse is entered via the STEP line BNC connector at the rear or when a trigger command is sent via the GPIB.

Command : [:SOURce]:LIST:TIMer <num_value> | MIN | MAX | DEF
Query : [:SOURce]:LIST:TIMer? MIN | MAX | DEF
Response : <time>

<time> The step interval time in units of 0.001 seconds.
MIN The minimum step interval time (0.1 seconds).
MAX The maximum step interval time (60 seconds).
DEF The default step interval time (0.1 seconds).

Sets or reports the interval time between 2 sequential steps. Stepping is done for all output channels at the same time with the same start and stop address in the sequence list for each output channel.

Command : [:SOURce]:LIST:VOLTage <num_val>{,<num_val>}

<num_val> Programmed voltage in the range from MIN to MAX.

Sets the voltage value at the selected memory address for the selected output channel. In one command as many voltages can be specified as there are addresses to be filled. The filling of addresses is incremental, i.e. 1, 2, 3, etc.

Query : [:SOURce]:LIST:VOLTage:POINts?
Response : <integer>

<integer> number of points in the voltage list from start unto and inclusive stop address

Returns the number of voltage points (max. 99) in the predefined sequence list for the selected output channel.

Query : [:SOURce]:POWer:LIMit:HIGH?
Response : <max_power>

<max_power> = maximum allowed power, e.g. 60.000.

Returns the maximum power of the selected output channel.

Command : [:SOURce]:VOLTage[:LEVel][:IMMediate][:AMPLitude]
<voltage> | MIN | MAX | DEF

Query : [:SOURce]:VOLTage[:LEVel][:IMMediate][:AMPLitude]?
MIN | MAX | DEF

Response : <voltage>

<voltage> A numeric value in the range 0 to the maximum output voltage of the output channel.

MIN Minimum level of the output voltage.

MAX Maximum level of the output voltage, depending upon the maximum power and the current setting.

DEF Actual value of the output voltage.

Sets or returns the output voltage for the selected output channel. The power supply will round the <voltage> parameter to the nearest multiple of the resolution.

Command : [:SOURce]:VOLTage[:LEVEL][:IMMediate][:AMPLitude]:AUTO
<boolean>|ONCE

Query : [:SOURce]:VOLTage[:LEVEL][:IMMediate][:AMPLitude]:AUTO?

Response : <boolean>

<boolean> = 0 means parameter coupling disabled (OFF = 0)
1 means parameter coupling enabled (ON = 1)

ONCE = coupled only for the next voltage and/or current setting command

Enables/disables or reports the coupling of the voltage and the current parameter of the selected output channel.

Query : [:SOURce]:VOLTage:LIMit:HIGH?

Query : [:SOURce]:VOLTage:LIMit:LOW?

Response : <voltage>

<voltage> = maximum (HIGH) or minimum (LOW) voltage setting.

Returns the maximum or the minimum voltage setting of the selected output channel.

Command : [:SOURce]:VOLTage:PROTection[:LEVel]
<overvoltage> | MIN | MAX | DEF

Query : [:SOURce]:VOLTage:PROTection[:LEVel]? MIN | MAX | DEF

Response : <overvoltage>

<overvoltage> The overvoltage level in the range MIN to MAX
MIN The minimum overvoltage (2 V)
MAX The maximum overvoltage (max. voltage + 2 V)
DEF The actual overvoltage

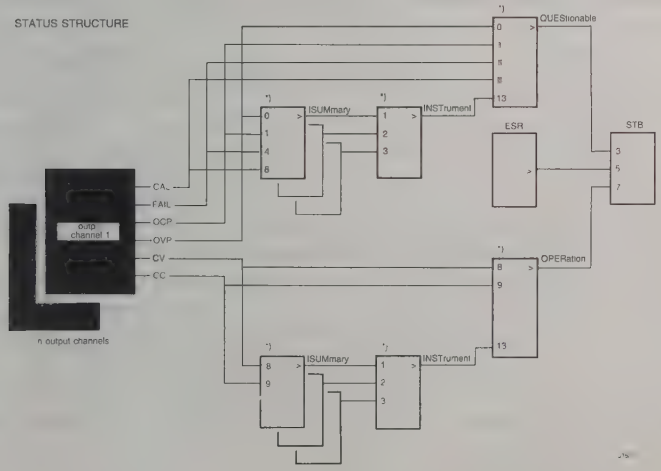
Sets or returns the overvoltage level of the selected output channel. The power supply will round the <overvoltage> parameter to the nearest multiple of the resolution.

Query : [:SOURce]:VOLTage:PROTection:TRIPped?

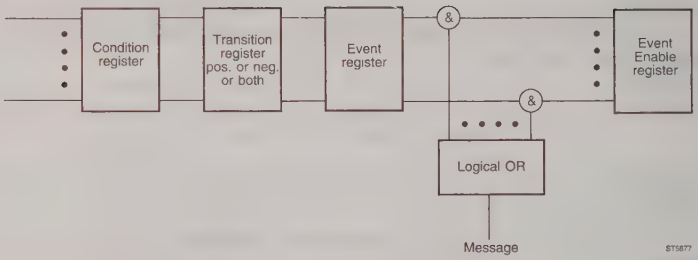
Response : 0 | 1

0 The overvoltage protection circuit did not trip.
1 The overvoltage protection circuit has tripped.

Reports whether the overvoltage protection circuit has been tripped or not (overvoltage level has been exceeded or not).



REGISTER STRUCTURE



For the following registers the decimal bit values of the events concerned are summarized to a total decimal value (bit weight):

STAT:OPER:COND|ENAB|EVEN|NTR|PTR registers:
STAT:OPER:INST:ISUM<N>:COND|ENAB|EVEN|NTR|PTR registers:

Bit:	Decimal:	Event: Table 1
8	256	CV mode output channel 1
9	512	CC mode output channel 1
13	8192	INSTrument summary (all channels) (not for STAT:OPER:INST:ISUM<N>)

STAT:OPER:INST:COND|ENAB|EVEN|NTR|PTR registers:
STAT:QUES:INST:COND|ENAB|EVEN|NTR|PTR registers:

Bit:	Decimal:	Event: Table 2
1	2	Summary of output channel 1
2	4	Summary of output channel 2
3	8	Summary of output channel 3

STAT:QUES:CONDIENABIEVENINTRIPTR registers:
STAT:QUES:INST:ISUM<N>:CONDIENABIEVENINTRIPTR registers:

Bit:	Decimal:	Event: Table 3
0	1	OverVoltage Protection output channel 1
1	2	OverCurrent Protection output channel 1
4	16	Overtemp. / open sense output channel 1
8	256	Calibration invalid output channel 1
13	8192	INSTrument summary (all channels) (not for STAT:QUES:INST:ISUM<N>)

Values can be given in:
- decimal <value>, e.g. 10
- hexadec. #h<value>, e.g. #hA
- octal #q<value>, e.g. #q12
- binary #b<value>, e.g. #b1010

Query : :STATus:OPERation:CONDition?
Response : <oper_cond>
Query : :STATus:QUEStionable:CONDition?
Response : <ques_cond>

<oper_cond> The contents of the Operation Condition Register in the range 0 to 8960 decimal. Refer to Table 1 bits 8,9,13.

<ques_cond> The contents of the Questionable Condition Register in the range 0 to 8467 decimal. Refer to Table 3 bits 0,1,4,8,13.

Reports the contents of the Operation or Questionable Condition Register.

Command : :STATus:OPERation:ENABle <oper_mask>
Query : :STATus:OPERation:ENABle?
Response : <oper_mask>
Command : :STATus:QUEStionable:ENABle <ques_mask>
Query : :STATus:QUEStionable:ENABle?
Response : <ques_mask>

<oper_mask> The contents of the Operation Enable Register in the range 0 to 8960 decimal. Refer to Table 1 bits 8,9,13.

<ques_mask> The contents of the Questionable Enable Register in the range 0 to 8467 decimal. Refer to Table 3 bits 0,1,4,8,13.

Sets or reports the contents of the Operation or Questionable Enable Register, allowing events which are true in the Event Register to be reported by the Summary bit in the Status Byte Register.

Query : :STATus:OPERation[:EVENt]?
Response : <oper_event>
Query : :STATus:QUEStionable[:EVENt]?
Response : <ques_event>

<oper_event> The contents of the Operation Event Register in the range 0 to 8960 decimal. Refer to Table 1 bits 8,9,13.

<ques_event> The contents of the Questionable Event Register in the range 0 to 8467 decimal. Refer to Table 3 bits 0,1,4,8,13.

Reports the contents of the Operation or Questionable Event Register. The Event Register is cleared when it is read.

Query : :STATus:OPERation:INSTrument:CONDition?
Query : :STATus:QUEStionable:INSTrument:CONDition?
Response : <cond_data>

<cond_data> The contents of the Instrument Condition Register in the range 0 to 14 decimal. Refer to Table 2 bits 1,2,3.

Reports the contents of the Operation or Questionable Instrument Condition Register

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Command : :STATus:OPERation:INSTrument:ENABle <enable_mask>
Query : :STATus:OPERation:INSTrument:ENABle?
Command : :STATus:QUEStionable:INSTrument:ENABle <enable_mask>
Query : :STATus:QUEStionable:INSTrument:ENABle?
Response : <enable_mask>

<enable_mask> The contents of the Instrument Enable Register in the range 0 to 14 decimal. Refer to Table 2 bits 1,2,3.

Sets or reports the contents of the Operation or Questionable Instrument Enable Register, allowing events which are true in the Instrument Event Register to be reported by the Instrument Summary bit in the Status Register.

Query : :STATus:OPERation:INSTrument[:EVENt]?
Query : :STATus:QUEStionable:INSTrument[:EVENt]?
Response : <event_data>

<event_data> The contents of the Instrument Event Register in the range 0 to 14 decimal. Refer to Table 2 bits 1,2,3.

Reports the contents of the Operation or Questionable Instrument Event Register. The Instrument Event Register is cleared when it is read.

Query : :STATus:OPERation:INSTrument:ISUMmary<N>:CONDition?
Response : <oper_cond>
Query : :STATus:QUEStionable:INSTrument:ISUMmary<N>:CONDition?
Response : <ques_cond>

<oper_cond> The contents of the Operation Summary<N> Condition Register in the range 0 to 768 decimal. Refer to Table 1 bits 8,9.

<ques_cond> The contents of the Questionable Summary<N> Condition Register in the range 0 to 275 decimal. Refer to Table 3 bits 0,1,4,8.

Reports the contents of the Operation or Questionable Summary Condition Register of output channel N.

Command : :STATus:OPERation:INSTrument:ISUMmary<N>:ENABle <oper_cond>
Query : :STATus:OPERation:INSTrument:ISUMmary<N>:ENABle?
Response : <oper_cond>
Command : :STATus:QUEStionable:INSTrument:ISUMmary<N>:ENABle <ques_cond>
Query : :STATus:QUEStionable:INSTrument:ISUMmary<N>:ENABle?
Response : <ques_cond>

<oper_cond> The contents of the Operation Summary<N> Enable Register in the range 0 to 768 decimal. Refer to Table 1 bits 8,9.

<ques_cond> The contents of the Questionable Summary<N> Enable Register in the range 0 to 275 decimal. Refer to Table 3 bits 0,1,4,8.

Sets or reports the contents of the Operation or Questionable Summary Enable Register of output channel N, allowing events which are true in the Summary Event Register to be reported by the instrument Summary<N> bit in the Status Register.

Query : :STATus:OPERation:INSTrument:ISUMmary<N>[:EVENt]?
Response : <oper_cond>
Query : :STATus:QUEStionable:INSTrument:ISUMmary<N>[:EVENt]?
Response : <ques_cond>

<oper_cond> The contents of the Operation Summary<N> Event Register in the range 0 to 768 decimal. Refer to Table 1 bits 8,9.

<ques_cond> The contents of the Questionable Summary<N> Event Register in the range 0 to 275 decimal. Refer to Table 3 bits 0,1,4,8.

Reports the contents of the Operation or Questionable Summary Event Register of output channel N. The Summary Event Register is cleared when it is read.

Command : :STATus:OPERation:INSTrument:ISUMmary<N>:NTRansition <oper_filter>
Command : :STATus:OPERation:INSTrument:ISUMmary<N>:PTRansition <oper_filter>
Query : :STATus:OPERation:INSTrument:ISUMmary<N>:NTRansition?
Query : :STATus:OPERation:INSTrument:ISUMmary<N>:PTRansition?
Response : <oper_filter>
Command : :STATus:QUEStionable:INSTrument:ISUMmary<N>:NTRansition <ques_filter>
Command : :STATus:QUEStionable:INSTrument:ISUMmary<N>:PTRansition <ques_filter>
Query : :STATus:QUEStionable:INSTrument:ISUMmary<N>:NTRansition?
Query : :STATus:QUEStionable:INSTrument:ISUMmary<N>:PTRansition?
Response : <ques_filter>

<oper_filter> The contents of the Operation Summary Transition filter in the range 0 to 768 decimal. Refer to Table 1 bits 8,9.

<ques_filter> The contents of the Questionable Summary Transition filter in the range 0 to 275 decimal. Refer to Table 3 bits 0,1,4,8.

Sets or reports the contents of the Operation or Questionable Summary Positive or Negative TRansition Register of output channel N. This Positive or Negative Transition filter specifies which bits in the Instrument Condition Register, that make a positive (0 --> 1) or negative (1 --> 0) transition, will set the corresponding bits in the Instrument Event Register.

Command : :STATus:OPERation:INSTrument:NTRansition <filter_set>
Command : :STATus:OPERation:INSTrument:PTRansition <filter_set>
Query : :STATus:OPERation:INSTrument:NTRansition?
Query : :STATus:OPERation:INSTrument:PTRansition?
Command : :STATus:QUEStionable:INSTrument:NTRansition <filter_set>
Command : :STATus:QUEStionable:INSTrument:PTRansition <filter_set>
Query : :STATus:QUEStionable:INSTrument:NTRansition?
Query : :STATus:QUEStionable:INSTrument:PTRansition?
Response : <filter_set>

<filter_set> The contents of the Instrument Transition filter in the range 0 to 14 decimal. Refer to Table 2 bits 1,2,3.

Sets or reports the contents of the Operation or Questionable Instrument Positive or Negative TRansition Register. This Positive or Negative Transition filter specifies which bits in the Instrument Condition Register, that make a positive (0 --> 1) or negative (1 --> 0) transition, will set the corresponding bits in the Instrument Event Register.

Command : :STATus:OPERation:NTRansition <oper_filter>
Command : :STATus:OPERation:PTRansition <oper_filter>
Query : :STATus:OPERation:NTRansition?
Query : :STATus:OPERation:PTRansition?
Response : <oper_filter>
Command : :STATus:QUEStionable:NTRansition <ques_filter>
Command : :STATus:QUEStionable:PTRansition <ques_filter>
Query : :STATus:QUEStionable:NTRansition?
Query : :STATus:QUEStionable:PTRansition?
Response : <ques_filter>

<oper_filter> The contents of the Operational Transition filter in the range 0 to 8960 decimal. Refer to Table 1 bits 8,9,13.

<ques_filter> The contents of the Questionable Transition filter in the range 0 to 8467 decimal. Refer to Table 3 bits 0,1,4,8,13.

Sets or reports the contents of the Operation or Questionable Positive or Negative TRansition Register. This Positive or Negative Transition filter specifies which bits in the Condition Register, that make a positive (0 --> 1) or negative (1 --> 0) transition, will set the corresponding bits in the Event Register.

Command : :STATus:PRESet

Presets the following status registers as follows:

OPERation	ENABle	all bits preset to zero
	PTRansition	all bits preset to one (32767)
	NTRansition	all bits preset to zero
QUEStionable	ENABle	all bits preset to zero
	PTRansition	all bits preset to one (32767)
	NTRansition	all bits preset to zero
ISUMmary	ENABle	all bits preset to zero
	PTRansition	all bits preset to one (32767)
	NTRansition	all bits preset to zero
INSTrument	ENABle	all bits preset to one (32767)
	PTRansition	all bits preset to one (32767)
	NTRansition	all bits preset to zero

Query : :STATus:QUEue[:NEXT]?
Response : <error_number>,<error_message>
Query : :SYSTem:ERRor?
Response : <error_number>,<error_message>

<error_number> An integer value in the range -32768 to 32767. If 0 (zero) is returned there are no errors in the queue.

<error_message> A character sequence which briefly describes the error. When there are no errors in the queue the error message will be "No error".

Reports the next error message held in the instrument's error queue. Once an error is read, it is removed from the queue and the next error message is made available.

Command : :SYSTem:KLOCk <boolean>
Query : :SYSTem:KLOCk?
Response : <boolean>

<boolean> = 0 means keyboard unlocked (OFF = 0)
1 means keyboard locked (ON = 1)

Locks (disables) or unlocks (enables) the keyboard or reports whether the keyboard has been locked or not. In the locked state the keys can not be used after pressing the LCL key. The keyboard can be unlocked again by pressing the ENTER key for at least 5 seconds.

Command : :SYSTem:POCLear <boolean>
Query : :SYSTem:POCLear?
Response : <boolean>

<boolean> = 1 power supply is in the STANDBY mode
0 power supply is in the mode that it was in at the moment of 'power off', i.e. the STANDBY or the OPERATE mode

Defines or reports the 'Power On CLear" behaviour.

Command : :SYSTem:SET <block_data>
Query : :SYSTem:SET?
Response : <block_data>

<block_data> = arbitrary block_program_data (begins with #)

Sets the programmable functions in a fast way, using the block_data, which was previously retrieved by the query.

Command : :SYSTem:UNPRotect:PWORd <password>[,<handle>]

<password> 4 digit admission code;
default = number in type-number, e.g. 2811

<handle> option handle to be selected;
CAL(ibration) is the only available option

Defines a new password to the optional handle CALibration.

Command : :SYSTem:UNPRotect:SELect <password>[,<handle>]
Query : :SYSTem:UNPRotect:SELect?
Response : <handle>

<password> 4 digit admission code; default = number in type-number, e.g. 2811 for the PM2811

<handle> option handle to be selected; CAL(ibration) is the only available option

Selects or reports a handle, protected by a password, to become unprotected.

Command : :SYSTem:UNPRotect[:STATe] <boolean>
Query : :SYSTem:UNPRotect[:STATe]?
Response : <boolean>

<boolean> = 1 unprotects the selection of handles (ON =1)
0 protects the selection of handles (OFF = 0)

Disables (protects) or enables (unprotects) the selection of handles or reports whether they have been protected or not. Before a password can be changed or a handle can be used, they have to be unprotected. After using, the selection of handles must be protected again.

Command : :SYSTem:VERSion <float>
Query : :SYSTem:VERSion?
Response : <float>

<float> floating point value

Selects or reports the version of the SCPI command set, that your programmable power supply complies to. The floating point value will be rounded to xxxx.y, e.g. 1990.0.

Query : :TEST:INSTrument?
Query : :TEST:SYSTem?
Response : 0 | <integer>

0 no error has occurred during the self test

<integer> error-code, which indicates the first error that occurred during the self test

TEST:INSTrument? performs the self test of the selected output channel and reports the test result.

TEST:SYSTem? only reports the test result of the latest power on self tests.

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